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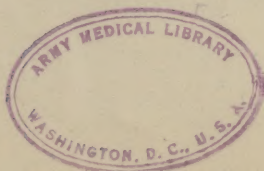
Army Medical Department



Research and Graduate School



ARMY MEDICAL CENTER
WASHINGTON, D.C.



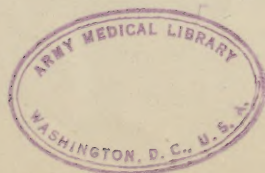
U.S. Army Medical Department



Research and Graduate School



ARMY MEDICAL CENTER
WASHINGTON, D.C.



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ARMY MEDICAL CENTER

Major General Paul H. Streit, Medical Corps, USA,
Commanding

Colonel Joseph U. Weaver, Medical Corps,
Deputy Post Commander

Lieutenant Colonel Wilfred A. Emond, Medical Service Corps,
Executive Officer

ARMY MEDICAL DEPARTMENT RESEARCH AND GRADUATE SCHOOL

Colonel Elbert DeCoursey, Medical Corps,
Commandant

Major William T. Gaudy, Medical Service Corps,
Executive Officer

Captain Edward S. Adams, Medical Service Corps,
Administrative Officer

Brigadier General Oscar P. Snyder, Dental Corps,
Director, Dental Division

Lieutenant Colonel Robert H. Yager, Veterinary Corps,
Director, Veterinary Division

ARMY MEDICAL CENTER

Major General Paul H. Strick, Medical Corps, USA,
Commanding

Colonel Joseph U. Sawyer, Medical Corps,
Deputy Post Commander

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ARMY MEDICAL DEPARTMENT RESEARCH AND GRADUATE SCHOOL

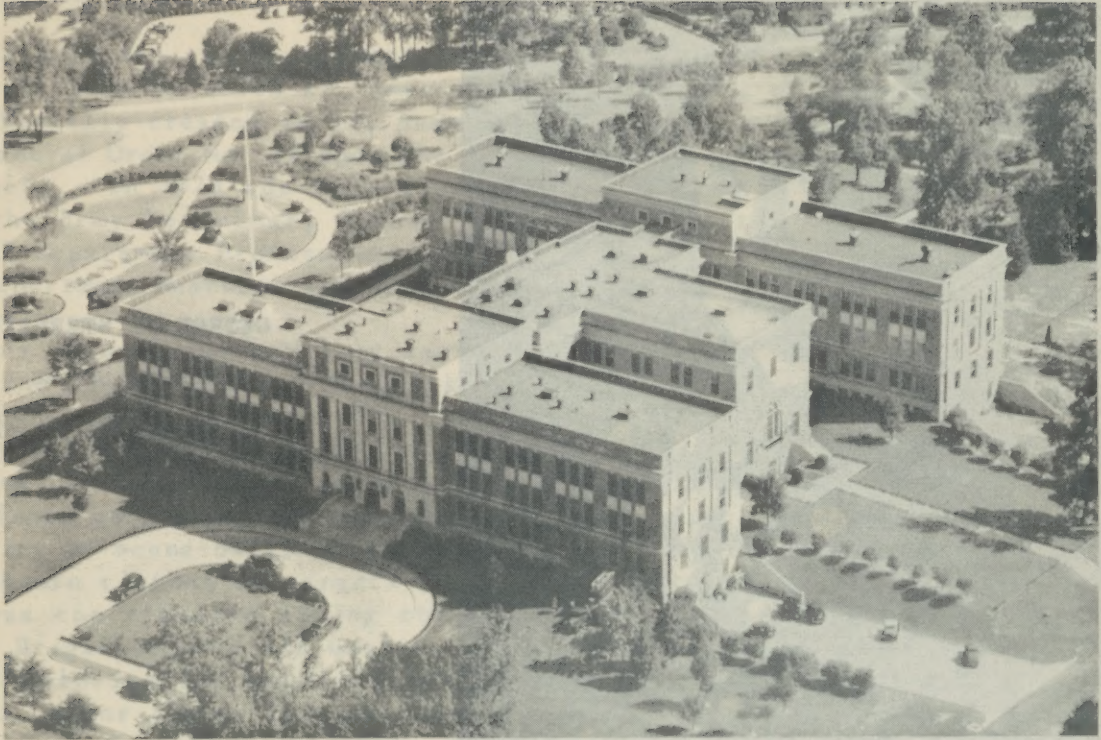
Colonel Elbert D. Conway, Medical Corps,
Commandant

Major William T. Gandy, Medical Service Corps,
Executive Officer

Captain Edward B. Adams, Medical Service Corps,
Administrative Officer

Brigadier General Oscar P. Snyder, Dental Corps,
Director, Dental Division

Lieutenant Colonel Robert H. Yager, Veterinary Corps,
Director, Veterinary Division



THE ARMY MEDICAL DEPARTMENT RESEARCH AND GRADUATE SCHOOL

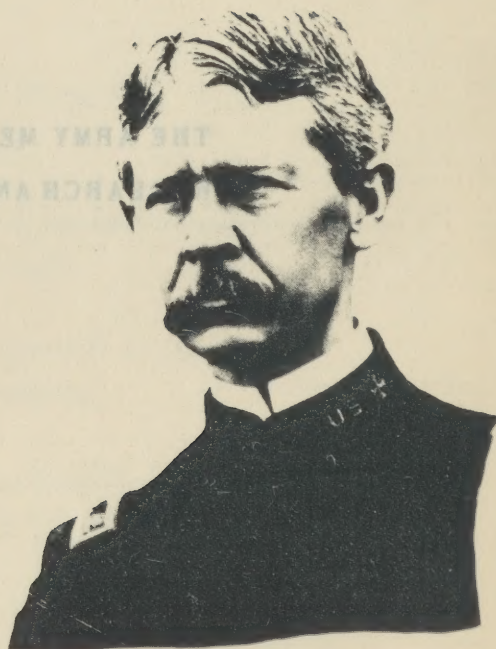


GEORGE M. STERNBERG

Founder of the
Army Medical School

WALTER REED

Pioneer in Preventive Medicine
and first Professor of Bacteriology
and Clinical Microscopy
Army Medical School



1. HISTORICAL

The Army Medical Department Research and Graduate School, once described by Dr. William H. Welch as "America's oldest school of Preventive Medicine", was officially created as the Army Medical School in June 1893 by War Department General Order No. 51 upon the recommendation of Surgeon General George M. Sternberg. In 1923 the School was moved to the Army Medical Center where, with the Army Veterinary School and the Army Dental School, it became the Medical Department Professional Service Schools. In 1947 the name Army Medical Department Research and Graduate School was adopted.

Many illustrious men have served on the faculty. General Sternberg, who wrote the first American Textbook of Bacteriology, also performed the first virus neutralization test (1892, Vaccinia). Captain (later Major) Walter Reed, the first Professor of Clinical and Sanitary Microscopy, demonstrated the importance of contaminated water and of house flies in the transmission of typhoid fever during the Spanish-American War. Colonel L. A. LaGarde, the early authority on wound ballistics, initiated the use of water-filled cans to simulate human tissues as targets for rifle bullets. His textbook on this subject was the standard during the first two decades of this century. Major (later Brigadier General) Carl R. Darnall originated and developed the use of liquid chlorine for purification of water, a procedure still used in most cities. Major (later Colonel) Henry J. Nichols collaborated with Ehrlich in the work on salvarsan and wrote the first American book (1922) on "Carriers in Infectious Diseases". Captain (later Brigadier General) Frederick F. Russell supervised development of a satisfactory typhoid vaccine and introduced large scale military vaccination. Colonel Charles F. Craig cultured amebae and wrote many basic monographs on malaria, amebiasis and clinical parasitology. He later organized the Department of Tropical Medicine of the School of Medicine of Tulane University. The Charles F. Craig annual lectureship of the American Society of Tropical Medicine reflects his international renown. Major F. E. Rodriguez of the Dental Corps was the first to isolate lactobacilli from carious teeth and emphasize their importance in dental caries. In 1925 Major (later Brigadier General) James S. Simmons described the widely used "Simmons Citrate Agar". He increased our knowledge of dengue by demonstrating (a) that dengue fever could be transmitted by Aedes albopictus, (b) infection with a single strain of virus produced complete immunity for at least 13 months, (c) that the virus can be transmitted to humans from monkeys, and (d) in collaboration with Captain (later Colonel) F. H. K. Reynolds of the Veterinary Corps, and Captain (later Lieutenant Colonel) J. H. St. John, Medical Corps, showed that transovarian transmission of dengue did not occur in mosquitoes. Simmons incriminated Anopheles punctimacula and three other previously unsuspected anophelines as vectors of malaria. With Major (now Colonel) V. H. Cornell, he demonstrated the mosquito transmission of the St. Louis encephalitis virus. During World War II he organized and directed the Army's preventive medicine program and is now Dean of the School of Public Health, Harvard University. Colonel Edward B. Vedder proved emetine to be the amebacidal agent in ipecac; as a member of the Tropical Medical Research Board, demonstrated that rice polishings contained the necessary substances to prevent beriberi (1913). An early worker in chemical warfare, he wrote the book "Medical Aspects of Chemical Warfare". Following Army retire-

ment he became Professor of Experimental Medicine at George Washington University Medical School. Colonel Joseph F. Siler analyzed strains of S. typhosa for immunogenic properties and developed a more potent typhoid vaccine. With co-workers he laid the groundwork for the later work on Vi antigen. Prior to this he worked out the exact mechanism of the transmission of dengue fever by Aedes aegypti and was a member of the Thompson-McFadden Pellagra Commission that laid the groundwork for the present concept of the cause of pellagra. Major (later Brigadier General) Raymond A. Kelser, Veterinary Corps, introduced chloroform treated rabies vaccine for the single injection immunization of dogs (1928); developed a diagnostic complement fixation test for Chagas' disease (T. cruzi) and wrote "Manual of Veterinary Bacteriology", now in its fifth edition. He first demonstrated the mosquito transmission of Eastern equine encephalomyelitis (1933). General Kelser is presently Professor of Bacteriology and Dean of the Faculty at the School of Veterinary Medicine, University of Pennsylvania. Colonel (later Brigadier General) George R. Callender organized the tropical medicine teaching program of World War II, and introduced a more modern viewpoint into the study of wound ballistics. His classification of ophthalmic melanomas evolved a new concept in the prognosis of these neoplasms. He is now Chief of the Laboratories Division of the Veterans Administration. Colonel Raymond Randall, Veterinary Corps, and associates, standardized methods for economical mass production of typhus vaccine (1942); he also introduced methods for purification of Eastern, Western, and Venezuelan encephalomyelitis vaccines for human use; with Babcock and Windham he found methods for the shipment of frozen milk without development of off flavors. He reported the first fatal case of naturally acquired Venezuelan encephalomyelitis in man (1944).

2. MISSION

To provide for the Medical Department a research and professional graduate training program and consultative service required for the Army's role in national defense.

a. Functions:

(1) The planning, operation, supervision and coordination of a research program for the Surgeon General of the Army to provide for the Medical Department's research and investigative requirements and to furnish through this program and other sources data, other teaching material and services required in function (2).

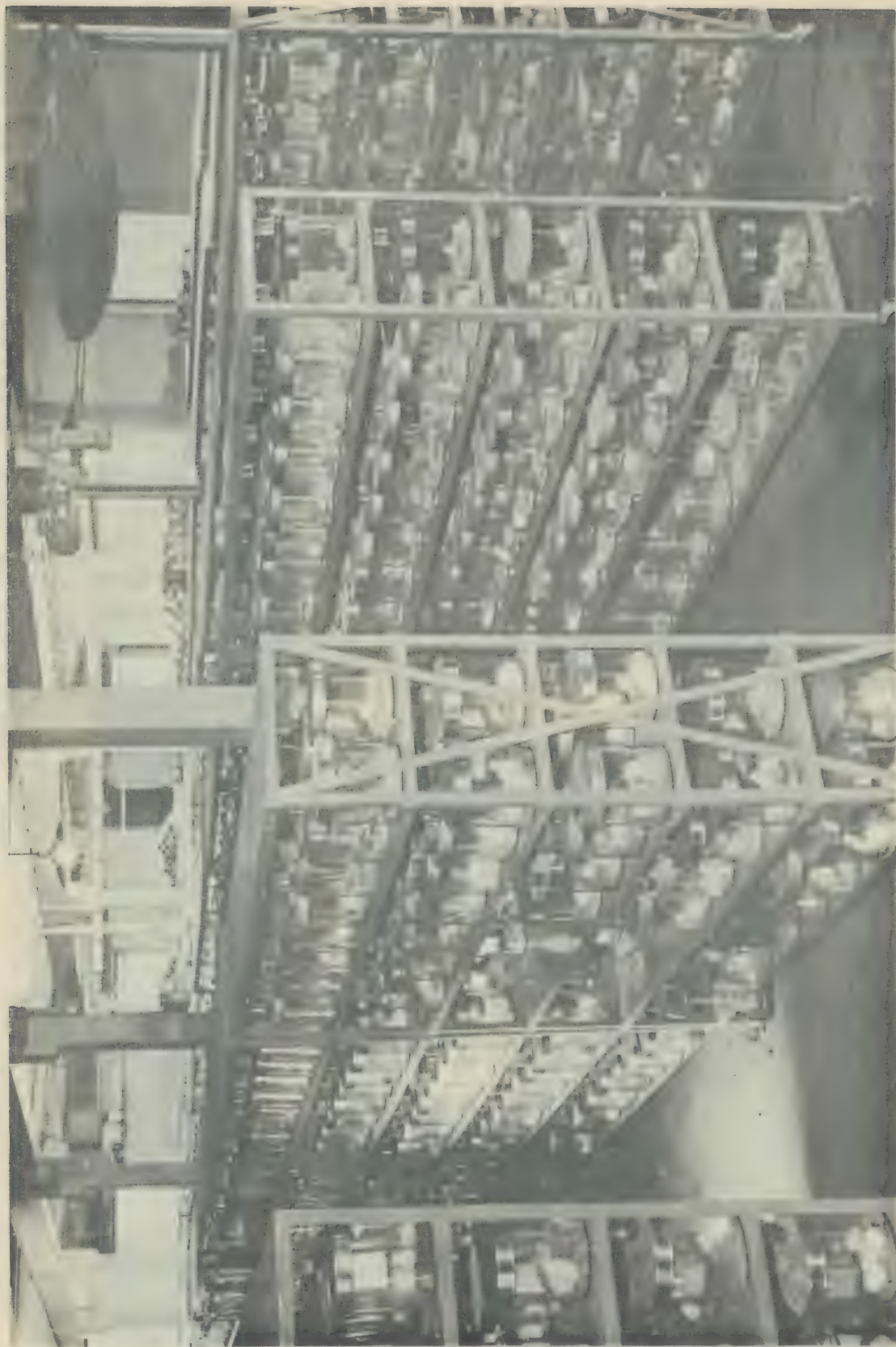
(2) The teaching of the professional technical data necessary to provide an adequate medical, dental, and veterinary service for the Army in time of war. The instruction primarily to cover technical information and training essential for adequate service in war but undeveloped or inadequately developed through normal civilian activities.

(3) The facilities for training and the results of research to be made available to other Federal services, the Organized Reserves, and to selected civilians.

(4) Pilot plant biological production where required.



Three professional libraries, Medical, Dental and Veterinary, are maintained at the Army Medical Department Research and Graduate School. Pictured is the Medical Library. Approximately 35% of all books are on permanent loan to School laboratories.



Preeding mice for scientific experiments. In these 2500 jars about 8000 mice are bred monthly. Glass jars have been found most satisfactory for daily observation of mice and periodic sterilization of the containers.

(5) Consultative and special diagnostic service in clinical and laboratory sciences where required.

3. COMMAND RELATIONSHIP

The Commandant, Army Medical Department Research and Graduate School, is one of the component commands directly under the Commanding General, Army Medical Center, which in turn is directly under the command of the Surgeon General, U.S. Army.

4. FACILITIES FOR RESEARCH

a. Floor Space:

(1) Building 40 (South Wing) - 55,711 sq. ft.

Laboratory	44,843.28	80%
Office	4,033.72	7%
Storage	2,016.86	4%
Shops	1,040.96	2%
Others	3,776.18	7%

(2) Building 40B (North Wing) - 55,911 sq. ft.

Laboratory	44,219.40	79%
Office	2,351.16	4%
Storage	3,687.15	7%
Shops	2,612.40	5%
Others	3,040.89	5%

(3) Building 83 (Animal Building) - 10,324.68 sq. ft.

Animals	8,775.98	85%
Storage	1,548.70	15%

b. Types of Laboratories:

Bacteriology	Parasitology
Biochemistry	Radiobiology
Dental	Serology
Electronmicroscopy	Veterinary
Hematology	Virus & Rickettsial Diseases
Immunology	Basic Sciences

c. Animals:

(1) Types:

In addition to the usual animals found in experimental biology and medicine many large animals (cattle and horses) have been used for specific problems; wild animals not usually found in laboratories are used in a search for natural hosts and reservoirs of certain diseases of importance to man.

(2) Facilities:

All guinea pigs and 40 per cent (about 70,000) of mice are bred in the animal house, losses being mostly from lack of temperature control. Facilities for handling animals in the experimental laboratories are available and are satisfactory except in extremely hot and humid weather.

d. Library:

A library of approximately 3,600 volumes is maintained and kept current. All professional journals reasonably expected to aid in research are regularly received.

e. Shops:

(1) Maintenance and Repair with a plumber, carpenter, mechanic and 5 helpers.

(2) Instrument, glass blowing, electronics and machine shops are planned and job descriptions for skilled personnel to adequately staff these shops have been approved.

5. SPECIAL EQUIPMENT

Cages, metabolism, air tight, for isotope research
Chamber, low temperature, low pressure
Electrodyne research stimulator
Electronic equipment, miscellaneous
Electron microscope, 50 KV
Electrophoresis, Tiselius
Freeze-dryers, large, 20 liter capacity, various types
Geiger counters, laboratory, with scalers
Geiger counters, survey meters
Oscillograph, recording
Oscilloscope, high intensity projection type
Potentiometers
Radioisotope handling apparatus
Respirometers, Warburg
Scopicon
Shadow casting chamber
Spectrograph, medium, quartz, Hilger
Spectrophotometers, infra red recording ultraviolet
Ultracentrifuge, air driven, Brams, concentration type
Ultracentrifuge, electric, Spinco, Analytical type
Ultracentrifuge, Sharples
Ultrasonic transducer

6. PERSONNEL (31 July 1949)

a. Military:

(1) Officers

Authorized - 39

Assigned (includes trainees) - 44

(2) Enlisted

Authorized - 39

Assigned - 53

b. Civilian:

	Authorized	Assigned
(1) Graded	168	177
(2) Ungraded	<u>7</u>	<u>9</u>
Totals	175	186

(3) Graded Civilians by Groups - 177

(a) Group A (P-7, 8, 9)	-	3
(b) Group B (P-5, 6)	-	8
(c) Group C (P-3, 4)	-	14
(d) Group D (all others)	-	152

(4) Consultants - 59

This group consists of men recognized as leaders and authorities in their various fields of scientific endeavor. Their assistance is invaluable in the orientation of much of the teaching and research program.

7. RESEARCH PROJECTS AND OTHER PROFESSIONAL PROGRAMS

a. Current Projects (numbered):

- 6-60-13-04 - Chemotherapy of Pathogenic Agents
- 6-61-03-21 - Survey of Animals to Find One Susceptible to Infectious Hepatitis
- 6-61-03-23 - Virus and Rickettsial Diseases
- 6-61-03-24 - Chemoprophylaxis and Chemotherapy of Scrub Typhus in Man
- 6-61-09-01 - Typhoid Fever
- 6-61-09-02 - Japanese Encephalitis Vaccine
- 6-61-09-03 - Bacillary Dysentery
- 6-61-09-04 - Quantitative Studies of the Antigen-Antibody Reaction
- 6-61-09-08 - Allergic Manifestations Following Use of Vaccines Prepared from Embryonated Eggs
- 6-61-09-10 - Studies in Fundamental Immunity
- 6-61-09-11 - Study of the Immunology of the Major and Minor Blood Groups



Evaluating the purity of virus preparations with the electron microscope in the
Department of Virus and Rickettsial Diseases



Metal shadowing of virus preparations prior to electron microscopy in order to enhance the detail of the specimen.

- 6-61-09-13 - Investigation of Procedures and Apparatus for the
Therapeutic and Immunizing Administration of Par-
enteral Agents
- 6-61-12-01 - Serodiagnosis of Parasitic Diseases
- 6-62-02-01 - Analysis, Laboratory Inspection and Storage of Dairy
and Meat Products
- 6-62-05-01 - Equine Encephalomyelitis
- 6-62-05-02 - Equine Influenza and Complications
- 6-62-05-03 - Equine Periodic Ophthalmia
- 6-62-05-04 - Equine Infectious Anemia
- 6-62-05-05 - Leptospirosis in Animals
- 6-63-05-01 - Dental Caries

b. Current Projects (unnumbered):

Adrenal Control of Translocation of Protein
 Application of Immunochemistry to the Study of Immunization to
 Typhoid Fever
 Blood Cytology and Tissue Morphology in Rats
 Chemical-Pathological Studies on Connective Tissue
 Chemotherapy of Parasitic Infections
 Clinical Use of Frame, Russell & Welhelmi's Colorimetric Amino N
 Method
 Comparison of Eosin - Acetone and Phloxine-Propylene
 Construction of an Integrating Electrocardiograph
 Effects of Chronic Stress Upon Resistance
 Effects of Elevated Body Temperatures on Cryptococcosis in Mice
 Establishment of Levels of White Blood Cell Count and Differential
 White Blood Cell Count, Hematocrit and Erythrocyte Sedimentation
 Rate in Rats
 Experimental Surgery on the Aorta
 Glycol Diluents for Eosinophil Counts
 Isolation, Identification of a Hemolytic Enzyme System
 Pleuropneumonia-like Organisms
 Preparation Techniques for Cardiolipin and Lecithin
 Production of Congenital Anomalies in Young of Trypan Blue Treated
 Female Rats
 Production of Stable Fat-Water Emulsions for Intravenous Alimentation
 Purification, Properties and Physiological Effects of a Mucolytic En-
 zyme (Hyaluronidase)
 Relation of the Adrenal to Erythrocyte Sedimentation Rate
 Relation of the Adrenal to Rate of Blood Regeneration in the Rat
 Scorbutic Guinea Pigs
 Serological Investigations in Mycotic Infections
 Sterilization of Potentially Icterogenic Plasma
 Studies of Metabolism of Medicinal Xanthines
 Tissue Distribution and Pharmacological Effects of Barbiturates in
 Animals
 Total Body Irradiation in Albino Mice

c. Teaching:

(1) Current Courses:

- (a) Basic Science Course
- (b) Dental Service, Operations and Administration
- (c) Dentistry (Advanced)
- (d) Medical Aspects of Nuclear Energy

(2) Proposed Courses:

- (a) Advanced Specialist Course in Medical Sciences
- (b) Recent Advances in Military Medicine (Staff-Officers)
- (c) Veterinary (Advanced)

(3) Training of scientific specialists in various fields, 6 months to 4 years

d. Consultation, reference and diagnostic laboratory to all other laboratories of the Army Medical Department.

e. Central laboratory for Veterans Administration

8. AFFILIATION AND LIAISON WITH OTHER AGENCIES

a. Research projects have been and will continue to be undertaken jointly with other military installations, other research facilities within the Federal Government, with universities, privately endowed research institutions, and foreign governments whenever it is believed that such joint effort may yield valuable scientific information with a justifiable expenditure of time and funds.

b. Extracurricular Activities of Staff:

Assistant Professor of Medicine, Georgetown University Medical School
Consultant, Division Biology and Medicine, Atomic Energy Commission
Consultant on Siphonaptera, Department of Agriculture
Consultant on Siphonaptera, U.S. National Museum
Consultant on Siphonaptera, U.S. Navy African Expedition
Director, Commission on Immunization, Army Epidemiological Board
Editorial Board, Journal of Immunology
Editorial Board, Proceedings of Society for Experimental Biology and Medicine
Member, Army Committee on Insect Control
Member, Committee on American Type Culture Collection, National Research Council
Member, Commission on Immunization, Army Epidemiological Board
Member, Committee on Research Fellowships in Virology, National Foundation for Infantile Paralysis
Member, Committee on Veterans Affairs, National Research Council
Member, Committee on Virus Research and Epidemiology, National Foundation for Infantile Paralysis

Member, Microbiology & Immunology, Study Section, Research Grants
& Fellowships, U.S. Public Health Service
Member, National Board of Medical Examiners
Member, Subcommittee on Communicable Diseases of the American Public
Health Association
Members, Virus and Rickettsial Study Section of National Health Ad-
visory Council

c. Teaching for Other Institutions:

(1) Lecturers for formal classes

- (a) George Washington University
- (b) Naval Medical School
- (c) Ohio State University
- (d) University of Maryland; various schools

(2) Students from other institutions

University of Maryland

d. Research with Foreign Governments:

During the past year a research group worked with representatives of the Colonial Medical Research Committee of the United Kingdom, the Army Medical Department Research and Graduate School being given generous credit in the official publication "COLONIAL RESEARCH".

9. STAFF

a. Military: The military staff is made up of:

- (1) Officers recognized as specialists in the various professional fields embraced by the School
- (2) Officers receiving on-the-job training to acquire specialist recognition in these fields
- (3) Administrative personnel

b. Civilian: The civilian staff is made up of personnel who are:

- (1) Recognized leaders in their professional fields
- (2) A group less well recognized but well established young scientists with promise of becoming recognized authorities
- (3) The necessary supporting, technical, administrative and unskilled personnel

10. ORGANIZATION

a. Dental Division:

(1) Historical

The performance of research has been an objective of the Army Dental School (now the Dental Division) since its establishment on 6 January 1922. The authorization for this division states, "such scientific research work and investigation in oral pathology and bacteriology should be pursued as directed and authorized".

Major Fernando E. Rodriguez, Dental Corps, first Director of Research in the Dental Division, was first to identify two strains of the Lactobacillus acidophilus-odontolyticus as factors in the etiology of dental caries. Major Rodriguez also developed a technique of determining quantitatively the incidence of these micro-organisms in the oral cavity by use of a special differentiating medium in conjunction with a plate colony count method. This method made possible the determination of the effects of dental caries control methods by providing the means of checking the actual reduction of the bacterial factor involved in the caries process. This method is in wide use today in determining the effectiveness of sodium fluoride and other prophylactic methods.

Following Major Rodriguez, Major (later Colonel) Clarence P. Canby, Dental Corps, carried on extensive investigations in the immunology of dental caries assisted by Captain Joseph L. Bernier, Dental Corps. Further work on this phase of investigation was conducted by Captain Ned B. Williams, Dental Corps.

(2) Research Projects

Etiology of Dental Caries (6-63-05-01). The present research program of the Dental Division has two main objectives: (a) the determination of factors responsible for and contributing to the development of dental caries, and (b) the prevention and/or control of dental caries. Pertinent to these objectives are studies of enzymatic reactions in the initiation and development of carious lesions, the antibiotic characteristics of certain oral micro-organisms and an evaluation of methods and techniques currently employed to reduce the incidence of dental caries. This latter project is a study of the effect of various pharmaceuticals upon the enzymatic reactions involved in the development of dental caries, and the effects of such agents in increasing the resistance of teeth to dental caries.

b. Medical Division:

(1) Department of Bacteriology

(a) Historical

Surgeon General Sternberg, under whom the Army Medical School was established in 1893, was one of the pioneers in the field of medical bacteriology. Among his many achievements was the isolation of the pneumococcus in 1881. In 1884 he recognized a close association between micrococci and food poisoning due to cheese, foreshadowing the demonstration of the role of staphylococci in food poisoning. The first course in bacteriology at the Army Medical School was given by General Sternberg.

The classic demonstration by Major Walter Reed of the mosquito transmission of yellow fever needs no elaboration. His work at the School has been described elsewhere.

In 1907, Captain (later Brigadier General) Frederick F. Russell became chief of the Department. His role in typhoid vaccination has been described. He also studied methods of detecting typhoid fever by culture and the performance of agglutination tests. He developed the well known "Russell's Double Sugar Medium" during the years of research on typhoid fever.

The Department assisted Major (later Brigadier General) Carl R. Darnall in demonstrating the value of liquid chlorine in water purification (1911).

Major (later Colonel) E. B. Vedder developed starch agar as a useful culture medium for maintaining gonococci (1915). He later published observations on "Evidence for the Transmission of Leprosy" (1931).

During 1918 and 1919 Major Russell Cecil and Captain Francis Blake produced and studied experimental pneumonia in monkeys; Major Teague described enrichment media for *Salmonella* and isolation media for *B. pestis*; and Major (later Colonel) A. P. Hitchens developed a plague vaccine. In the postwar years Hitchens showed the value of incorporating small amounts of agar in media for cultivating both aerobes and anaerobes. His work on substituting iodine for chlorine in water purification is interesting in view of the recent development of an iodine-containing tablet (triglycine hydroperiodide) as a superior means for purifying water in canteens. In addition to being editor of the Abstracts of Bacteriology he was in charge of the American Type Culture Collection and a member of the National Committee on Determinative Bacteriology. During this same period Major (later Colonel) Henry J. Nichols wrote the first American book on "Carriers in Infectious Diseases" (1922). He was also editor of the American Journal of Tropical Medicine.

In 1925 Major (later Brigadier General) James S. Simmons became Chief of the Department. He devised the widely used "Simmons Citrate Agar" in the following year and showed the limitations of mercurochrome for sterilization of the skin and for intravenous therapy in pyogenic infections.

Major (later Colonel) H. R. Livesay made important contributions on the identification of anaerobes and the diagnosis of infections caused by them, as well as in problems relating to characteristics of typhoid bacilli used in vaccines.

Captain C. V. Seastone and co-workers carried out the following important research during World War II:

1. The selection of those strains of V. comma having the highest immunogenic potentials
2. The study of over 360 Shigella strains to determine their antigenic and immunogenic potential for polyvalent vaccine for possible use in combating bacillary dysentery
3. Development of a rapid and specific single factor Shigella typing kit
4. Studies confirming the greater efficacy of soap containing G-11 over ordinary soaps used in the surgical scrub, in reducing the number of bacteria on the hands of surgeons

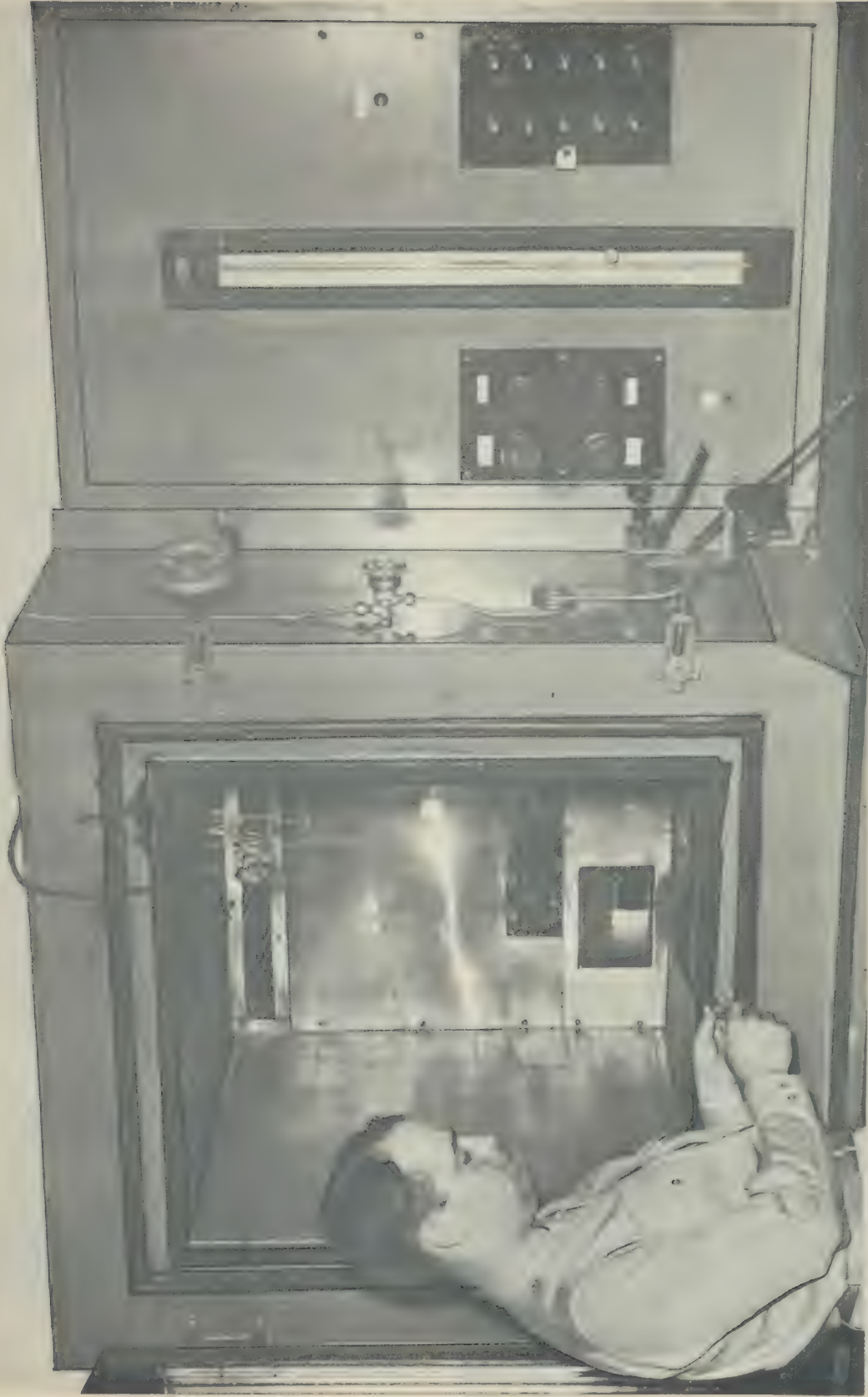
Also during World War II Captain Maurice Landy demonstrated that certain Staphylococcus strains produce para-aminobenzoic acid in sufficient quantity to counteract the action of sulfonamides, explaining the resistance of Staphylococci to sulfonamides.

(b) Research projects

1. Action of Antibiotics on Pathogenic Fungi. Available antibiotics have been tested for in vitro activity against important pathogenic fungi in a search for effective fungicidal agents. None have been found to date. Streptomycin has been found to stimulate growth in vitro of many of the agents causing pulmonary and systemic mycosis. Since many pulmonary mycoses simulate tuberculosis, frequently treated with streptomycin, this observation becomes important. In vivo studies are in progress.
2. Serologic Aids in Detecting Systemic Mycoses. This department devised a method for obtaining cultures of Histoplasma capsulatum in the yeast phase. The rise

and fall of complement-fixing antibodies in known infected human sera and in rabbit sera has been studied using antigens from these organisms. A collodion agglutination test for detection of antibodies to pathogenic fungi has been developed and used for detecting antibodies in human histoplasmosis. Comparative studies have been conducted in conjunction with the U.S. Public Health Service using these tests in parallel with tests routinely employed in their laboratories. Similar studies are in progress with various federal, teaching and privately endowed institutions.

3. A Study of Possible Therapeutic and Prophylactic Agents for Bacillary Dysentery. All available antibiotics are being studied for in vitro activity to determine their possible use to eliminate the carrier state of bacillary dysentery. Others will be studied as they become available. Those antibiotics which show activity in vitro will be used for in vivo experiments as patients are found.
4. Studies on the Classification of Enteric Bacteria. This department prepares specific Salmonella and Shigella typing serum for use in Army laboratories and serves as the reference center for identification of strains and types. A paracolon whose somatic antigens are identical with those of Shigella paradysenteriae Boyd P288 has recently been studied. Other paracolons which agglutinate strongly in absorbed serum for various Shigellae are being studied. Incubation at 35° C was found to be superior to 37° C for the development of definitive diagnostic criteria.
5. A Study of Pleuropneumonia-like Organisms Isolated from Human Sources. Among organisms implicated as possible etiologic agents of non-specific urethritis are a pleuropneumonia group. Investigation is hampered by the fastidious requirements of these organisms. Cystine trypticase agar, with added ingredients, has given visible growth regularly with isolated strains. With improved growth, antisera for available human strains have been produced for comparative antigenic study and for use in detecting possible antibodies in cases of non-specific urethritis.
6. Extraction of Group-specific Carbohydrates from Hemolytic Streptococci. Techniques for extracting "C" substance for grouping streptococci have been evaluated. A modification of the Lancefield technique was found to be responsible for some of the poor results, poor quality sera for others. A method employing streptomycetes proteolytic filtrate was found to be very effective, specific and suitable for the routine laboratory.



Small-animal high altitude chamber in the Department of Basic Science

7. Effects of Elevated Body Temperatures on Cryptococcosis in Mice. Earlier work by Lieutenant Colonel L. R. Kuhn (University of Chicago) indicated that pathogenic cryptococci fail to maintain themselves at temperatures above 103° F in vitro. Since specific therapy is lacking in human cryptococcosis, induced fever therapy might offer some hope if the organisms are as sensitive to elevated temperatures in vivo. In groups of mice whose average rectal temperatures were raised to the vicinity of 103° F, many mice survived long after those with temperatures averaging 99° F had died. Other aspects of this interesting infection are being studied.

(2) Basic Science

(a) Historical

This department was established 31 July 1947 for the purpose of presenting basic science instruction to residents from the Army resident program at a graduate level. It was directed to adopt new ideas and new concepts of instruction. The first class in Basic Science began 5 January and ended 24 April 1948; the second class was conducted from 10 January to 4 June 1949.

(b) Research projects

1. The personnel of this department have been unusually vigorous in the prosecution of individual research. There has been no "directed research" but there has been considerable emphasis on the part of the Chief in the principles of planning experimental work so as to avoid wasteful effort. Thirty-two unnumbered research projects have been undertaken by members of this department. Fourteen of these projects have been completed and papers submitted for publication. The remainder are in final stages.
2. Twelve Professional Medical Films (Sound Movies) have been undertaken by officers of this department in cooperation with the Illustration Service of the Armed Forces Institute of Pathology. Five of these films are now completed and seven are in production. The films comprise such subjects as radio-activity, respiratory physiology, enzyme chemistry, neuro-physiology, general adaptation syndrome and electro-cardiography. They are developed around the course of instruction in Basic Science, and serve as invaluable teaching aids; in addition, they become a permanent part of the Surgeon General's film library and are available for use by all medical installations and medical schools.



A portion of the facilities devoted to typhoid research, Department of Biologic Products. Cubicles are of metal alloy and glass construction and are air conditioned with precipitron purified, filtered air. The photograph depicts two of a series of such cubicles.

(3) Department of Biologic Products

(a) Historical

The Department of Biologic Products is an outgrowth of the Vaccine Department established by Captain (later Brigadier General) F. F. Russell in 1908 at the Army Medical School for production of typhoid vaccine. Except for occasional short term projects, production of typhoid vaccine was the major responsibility of the Department until 1 July 1946. On or shortly after that date three functional units of the Army Medical Department Research and Graduate School were consolidated with the Vaccine Department to create the Department of Biologic Products. Identity of these units and items of historical interest concerning each follow:

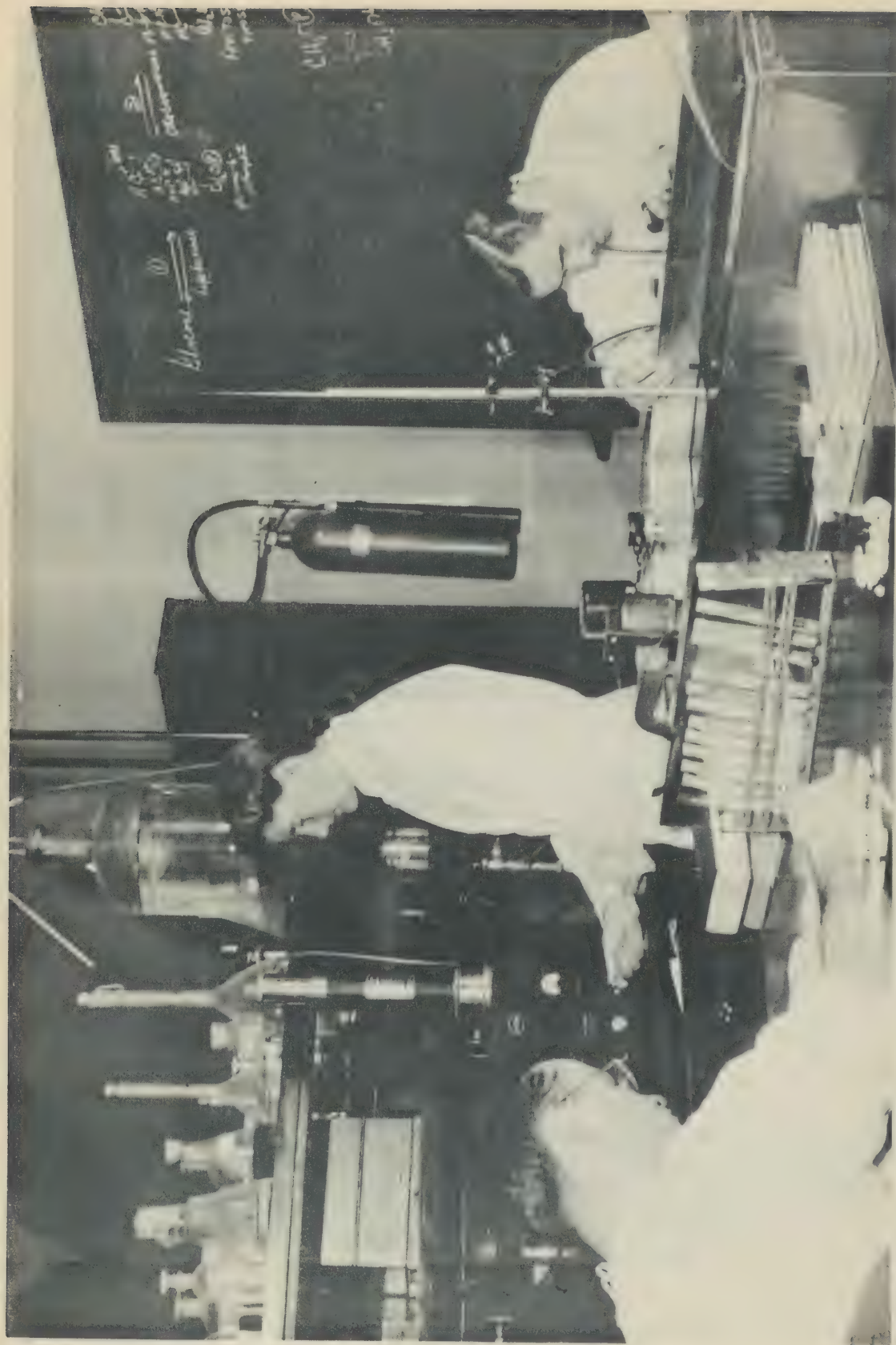
1. The Diagnostic Antigens and Antisera Production Section of the Department of Bacteriology. During World War II this section was active in research on the identification of *Shigella* organisms and (in cooperation with Dr. P. R. Edwards) of the *Salmonella* group. The present production and distribution of grouping and typing kits is an outgrowth of this research.
2. The Blood and Blood Products Section was established in 1940 for the purpose of studying physiological aspects of shock. Major emphasis was placed on studying and developing blood substitutes for transfusion therapy and this Department (in cooperation with the Navy and National Institutes of Health) was largely responsible for establishing standard procedures for (a) production, testing, and packaging liquid and dried plasma and other blood fractions, (b) Army blood banking procedures, and (c) the blood grouping and typing methods and reagents presently employed by the Army.
3. Typhoid Research Unit. This unit was organized and directed by Colonel J. F. Siler (1934-1939) for the purpose of studying and evaluating strains of *S. typhosa* for production of typhoid vaccine. The investigative work was continued by Major G. F. Luippold with the emphasis eventually changed to the study of the immunizing efficacy of Vi antigen from typhoid and non-typhoid sources.

During 1947 the Department of Biologic Products was assigned the responsibility of production and testing of Japanese encephalitis vaccine as a cooperative project with the Department of Virus and Rickettsial Diseases and the Veterinary Division.

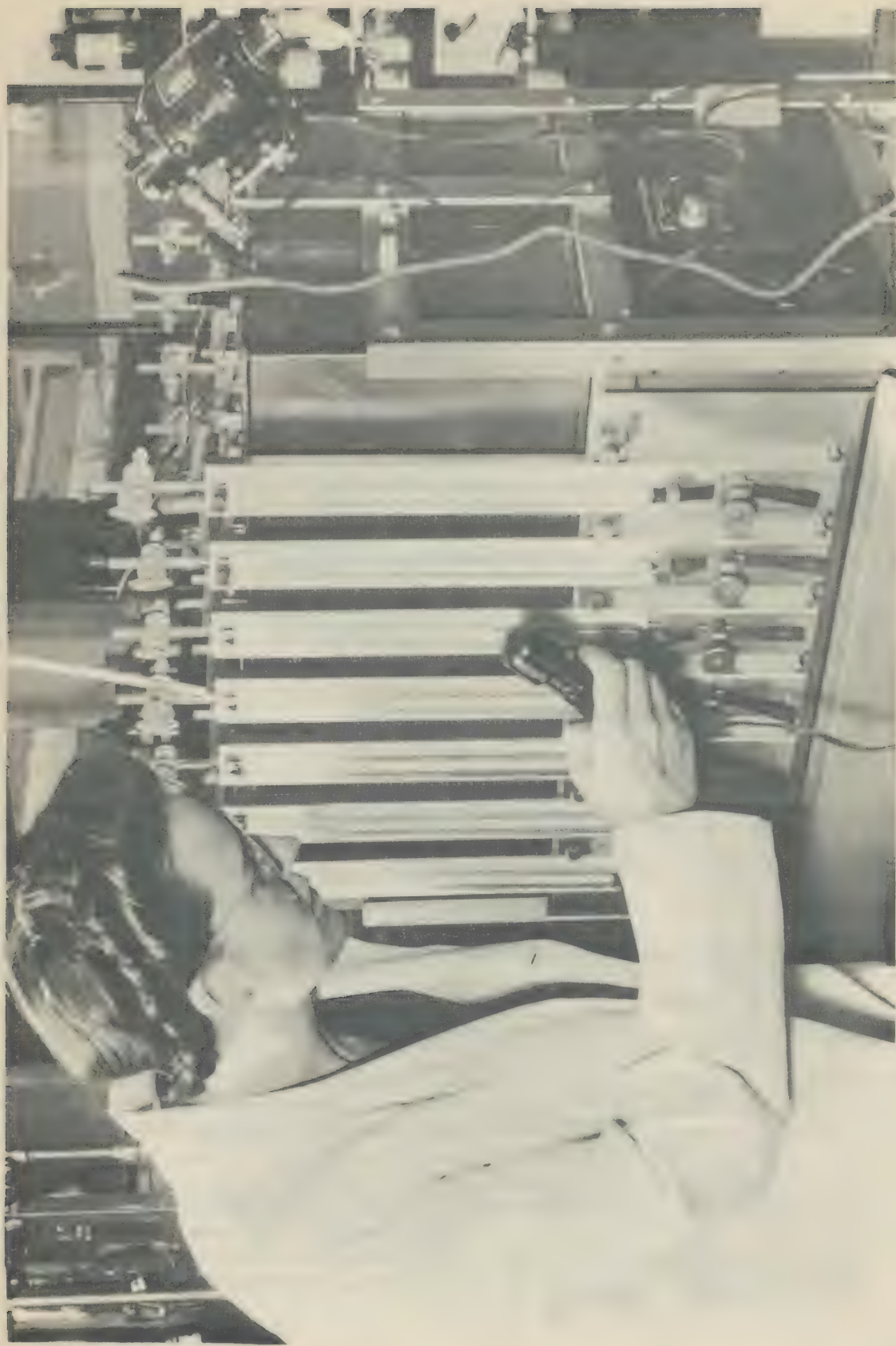
(b) Research projects

The primary missions assigned to the Department are production and service; however, research is supported as strongly as possible. The following numbered research projects are assigned to the Department:

1. Typhoid Fever (6-61-09-01). ' Investigations are being conducted into the relation of the physiology of bacteria to their immunologic properties and on the chemical nature of antigenic components of S. typhosa. The objective of the work is the preparation and evaluation of an immunizing agent consisting of the antigenic components which characterize S. typhosa, but derived from extrageneric sources.
2. Studies in Fundamental Immunity (6-61-09-10). This project consists primarily of the development and application of methods of experimental design and biometrics to problems in experimental immunology, biological assay and related problems of a quantitative nature.
3. Study of the Immunology of the Major and Minor Blood Groups (6-61-09-11).
 - a. Preservation of specific blood cells in Alsever's solution for definitive immunohematological tests.
 - b. Developmental study of collodion particle antigens for specific immunohematological tests.
 - c. Investigation of nonspecific hemagglutinins in patients.
 - d. A study of chemical preservatives for blood grouping and typing reagents.
4. Investigation of Procedures and Apparatus for the Therapeutic and Immunizing Administration of Parenteral Agents (6-61-09-13). As part of an evaluation study of the Hypospray Jet Injection method of administration of medicants a field trial of active immunization of military personnel with typhoid vaccine is being conducted. Field phases of the investigation have been completed and assays of serum specimens are in progress. Preliminary findings indicate that the method is scientifically sound but may be impractical for mass immunization.



Ultrasonic Vibrator used to extract enzymes from bacterial cells in the Department of Chemistry and Physics.



Warburg Apparatus used in studying the Metabolism of Microorganisms in the Department of Chemistry and Physics.

(4) Department of Chemistry and Physics

(a) Historical

The Army Medical School of 1894 included a laboratory course in analytical chemistry in its first curriculum with particular emphasis on the chemical aspects of sanitation, water purification, and to a lesser extent, toxicology. Keen interest and important research in these subjects have been maintained almost continuously for fifty years. Investigations ranged from research studies on the chemistry of chlorine containing compounds to extensive surveys on the stability, storage, and effectiveness of such materials under many climatic conditions.

The simple analytical aspects of toxicology introduced in 1894 have gradually been enlarged and improved to an extensive and modern toxicological service of special merit. The tradition of analytical service has, in general, dominated the activities of the Department to the time of World War II. Research was confined largely to development and evaluation of techniques and methods and to a supporting role for the medical research problems of other departments of the School. However, with the war a rapid development of independent biochemical research began in the fields of enzyme, protein and lipid chemistry, pharmacology and toxicology.

(b) Research projects

1. Blood Chemistry:

- a. Investigation and Evaluation of New Methods. These investigations include studies of blood iodine and magnesium and urinary steroid determinations.
- b. Clinical studies (in cooperation with Walter Reed General Hospital) involving electro-phoretic blood analyses, enzyme determinations and studies of unusual metabolic diseases.

2. Lipoid research includes:

- a. Studies on production methods and chemical nature of cardiolipin and purified lecithin for microflocculation tests.
- b. Investigation of isolation, purification and identification of the components of a new hemolytic enzyme system from normal tissues and its possible relation to hemolytic jaundice and to certain malignant diseases.

3. Pharmacology of Barbiturates:

- a. Pharmacological research includes the distribution of barbiturates in animal tissues as related to their anesthetic action.

4. Protein research includes:

- a. Several lines of investigation on the enzyme hyaluronidase:
- (1) Purification, isolation and properties of this enzyme
 - (2) Relation to capillary permeability
 - (3) Anti-hyaluronidase in scurvy, tyrosine metabolism and rheumatic fever
 - (4) In pathogenic fungi (a cooperative study with the Department of Bacteriology)
- b. Purification of Vi antigen (in cooperation with the Department of Biologic Products)
- c. Clinical studies on collagen in connection with heart disease.

(5) Department of Parasitology

(a) Historical

The present Department of Parasitology was formed by the merger of the Divisions of Entomology and Malariology shortly after the beginning of World War II. The Department is now comprised of the following sections:

1. Distributing Center for Parasitological Specimens
2. Entomology
3. Helminthology
4. Protozoology-Malariology

Before World War II the principal function of the divisions which now constitute the present department was the instruction of officers and enlisted technicians in the Tropical Medicine Courses. With the advent of the war, the teaching program was increased to the point that a total of over 13,000 hours of instruction were given. In addition to class instruction, members of the Department contributed to the preparation of texts such as "The Manual of Tropical Medicine" by Mackie, Hunter and Worth and "Practical Malariology" by Russell, West and Manwell.



Observing emergence of Schistosome Cercariae from snail intermediate host in the Department of Parasitology

Members of the Department have served with highly specialized organizations such as the United States Army Scrub Typhus Research Unit in Malaya, the United States of America Typhus Commission, the Commission on Schistosomiasis, and the Neurotropic Virus Commission. Others served as malariologists in various theaters of operations.

The forerunner of the present Department supplied parasitological teaching materials to various Army laboratories for a number of years. When the serious lack of such material became evident in medical schools and other institutions during the war, the present Distributing Center for Parasitological Specimens was established in the Department by a Committee of the Association of American Medical Colleges. The function of the Center was to furnish specimens for the proper training of personnel serving with the Armed Forces. Over 220,000 parasitological items have been shipped to medical schools, public health agencies and the military forces in the United States, Canada and Central America.

(b) Research projects

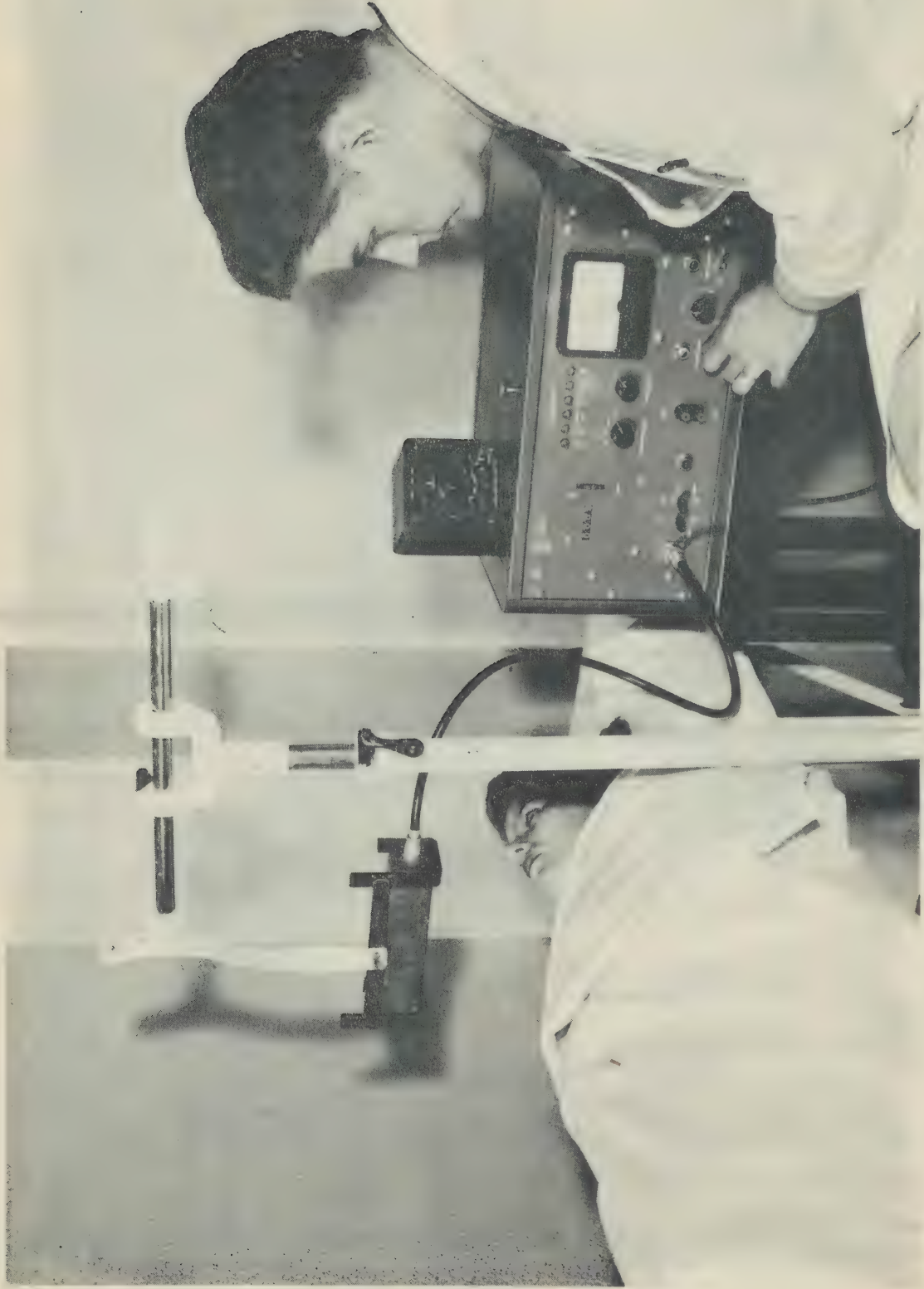
The research program of the Department includes the following:

1. Development of experimental antigens for the serodiagnosis of trypanosomiasis cruzi, schistosomiasis, and malaria
2. Effects of certain antibiotics and other drugs on Leishmania donovani and Trypanosoma cruzi and Schistosomiasis in vitro and/or in vivo
3. Observations on the epidemiology and control of scrub typhus
4. Studies on classification and morphology of Siphonoptera (fleas)
5. Studies on classification of Indo-Malayan Trombiculid and bloodsucking mites
6. Studies of the effect of certain antibiotics and other drugs on Endamoeba histolytica in vitro and in rabbits

(6) Department of Radiobiology

(a) Historical

This Department was officially opened in February 1949 to serve a recognized need for the Medical Department to carry out active research into the use of radioactive isotopes, and has been functioning without interruption since that date.



Determining thyroid gland function by measuring uptake of radioactive iodine with a Geiger-Muller counter in the
Department of Radiobiology

(b) Research projects

Research projects under active consideration at this time are:

1. Studies are being carried out in animals and eventually in man using radioactive isotopes to determine electrolyte distributions in various abnormal body water states.
2. A recent treatment proposed in cases of acute leukemia is that of massive replacement transfusions. Red blood cells, tagged with radioactive phosphorus, are being used in such transfusions in an effort to determine the actual amount of "wash out" of the original blood that occurs.
3. A project to correlate basal metabolic rate, radioiodine uptake by the thyroid gland, serum-bound iodine and the urinary excretion of iodine with the lean body mass as measured by the antipyrine method. It is hoped that from this work a more accurate method of estimation of thyroid function may be found.
4. Experiments have been carried out to determine the effects of the nitrogen mustards and phospholipid turnover in animals. Radioactive P^{32} was used in this study.
5. Synthetic work in tagging of organic compounds to be used in physiological and biochemical research.

(7) Department of Serology

(a) Historical

The Department of Serology originated as a laboratory for the diagnosis of syphilis in 1910. In that year Captain (later Colonel) Charles F. Craig devised a test which was a modification of Wassermann's test and also that of Noguchi. In 1912 he found that 72 per cent of patients treated with salvarsan by Captain (later Colonel) Henry James Nichols gave negative reactions after two months' therapy. In 1928, as a result of 13,000 parallel Wassermann and Kahn tests, Major (later Colonel) S. C. Schwartz recommended that the Kahn be used as an auxiliary test for the serological diagnosis of syphilis. In 1948 cardiolipin antigens were adopted by the Army as standard for serological tests for the serodiagnosis of syphilis, after exhaustive investigation by members of the Department.

In 1920 studies of the human blood groups led to the preparation of blood grouping antisera for routine use in Army hospitals prior to blood transfusions.

The first work on a complement-fixation test for amebiasis in 1927 by Lieutenant Colonel Charles F. Craig indicated that antibodies to E. histolytica were produced in some cases. From 1945 to 1947 an improved antigen, prepared from cultured E. histolytica, was used in a quantitatively standardized complement-fixation test.

During World War II the high incidence of malaria among troops was a stimulus to search for a complement-fixation test for this disease. This was done by Lieutenant Colonel Charles R. Rein and Captain John F. Kent. A study of sporozoite-induced malaria in human volunteers has indicated that the test may have considerable value as a tool to determine the incidence of malaria in a population.

Basic studies of the immune hemolysis phenomena required a quantitatively standardized test. John F. Kent of the Department devised methods for the spectrophotometric standardization of erythrocyte suspensions, complement and hemolysin in 1946. Graphs were constructed to simplify the determination of the 50 per cent unit of complement. The test has been designated E.P. 50 (End Point 50%).

(b) Research projects

1. False Positive Blood Tests for Syphilis (6-60-16-01).

a. Evaluation of methods for differentiating such reactions:

(1) The Euglobulin-Inhibition Test (Neurath)

(2) The Treponema-Immobilization Test (Nelson)

b. Studies of diseases eliciting false positive reactions:

(1) Amebiasis

(2) Infectious mononucleosis

(3) Malaria

c. Studies on the differentiation of true and false positive serologic reactions

2. The Laboratory Diagnosis of Syphilis (6-60-16-02).

a. Development and evaluation of a quantitatively standardized complement-fixation test (E.P. 50) for serum and spinal fluid

b. Evaluation of the sensitivity and specificity of newly devised diagnostic methods:

(1) The Lange quantitatively standardized colloidal gold techniques

(2) The VDRL macroflocculation tests for serum and spinal fluid

- c. Studies on the further improvement of cardiolipin antigens with particular emphasis on the standardization of lecithin

3. Quantitative Studies of the Antigen-Antibody Reaction (6-61-09-04).

- a. Development of a quantitative complement-fixation technique for evaluating relative antigenic activity
- b. Immune Hemolysis. Study of the effects of divalent cations upon the reaction and further development of quantitative spectrophotometric techniques
- c. Quantitative studies of factors determining the optimal adjustment of animal serums for the complement-fixation procedure

4. Serodiagnosis of Parasitic Diseases (6-61-12-01).

- a. Malaria. In association with the Division of Tropical Diseases, National Institutes of Health. The development of specific and sensitive antigens and their application in a quantitatively standardized complement-fixation procedure
- b. Schistosomiasis. Isolation of the specific antigenic principle of the parasite and its application in a quantitatively standardized complement-fixation test
- c. Trypanosomiasis. The preparation and purification of specific antigens and their application in the E.P. 50 complement-fixation test

(8) Department of Virus & Rickettsial Diseases

(a) Historical

The Department of Virus and Rickettsial Diseases was organized in January 1941 under the direction of Colonel Harry Plotz, and immediately became active in the investigation of an improved typhus fever vaccine in cooperation with other laboratories. These cooperative studies resulted in the development of a vaccine rich in rickettsiae and soluble antigen which was adopted by the Army late in 1942.

Many specific serological tests for the diagnosis of different rickettsial diseases have been developed in the department. These include the complement-fixation test for epidemic and murine typhus, Rocky Mountain spotted fever, boutonneuse fever, South African tick bite fever and the rickettsial agglutination test for epidemic and murine typhus. Using these tests exhaustive studies have been made of the serological response of patients suffering from murine and epidemic typhus.



Inoculation of influenza virus into the extra embryonic spaces of embryonated eggs for the production of diagnostic antigen.

A vaccine against Japanese encephalitis made from embryonated eggs was developed in the department to replace the mouse brain vaccine previously used by the Army. Although vaccine against Q fever had been employed in other laboratories to induce resistance in experimental animals the department was the first to produce a vaccine for human use.

The department has played a major role in the development of the antibiotic chloramphenicol (chloromycetin) for therapeutic and prophylactic use. Pioneer experimental work demonstrated its effectiveness against rickettsia and some large viruses in experimental animals. Its nontoxicity was demonstrated in volunteers. Field trials in Mexico and Malaya were staffed and directed by the department. As a result of these field trials chloramphenicol was shown to be effective in the prevention and treatment of scrub typhus, and in the treatment of epidemic and murine typhus, typhoid fever and gonorrhea.

The virus responsible for the influenza outbreak of 1947 was identified in the department and shown to be antigenically different from the strains incorporated in the vaccine used at that time. The virus strain was promptly incorporated in the standard influenza vaccine.

Extensive studies of the virus of encephalomyocarditis by department members have shown this virus to be identical with MM, Columbia-SK, and Mengo encephalitis virus.

(b) Research projects

The research program is concerned with diagnosis, prevention and treatment of virus and rickettsial diseases, and includes the projects listed below:

1. Chemotherapy of Pathogenic Agents (6-60-13-04).
 - a. Laboratory studies on the mode of action of chloromycetin against viral and rickettsial agents.
 - b. Screening and evaluation of various chemical and biological agents for their effects against viral infections.
2. Chemoprophylaxis and Chemotherapy of Scrub Typhus in Man with Chloromycetin (6-61-03-24).
 - a. Studies on the use of Chloromycetin in the chemoprophylaxis and chemotherapy of scrub typhus in the laboratory and in the field.
 - b. Clinical studies on the chemotherapy of typhoid fever
 - c. Clinical studies on Chloromycetin in the treatment of gonorrheal urethritis in the male



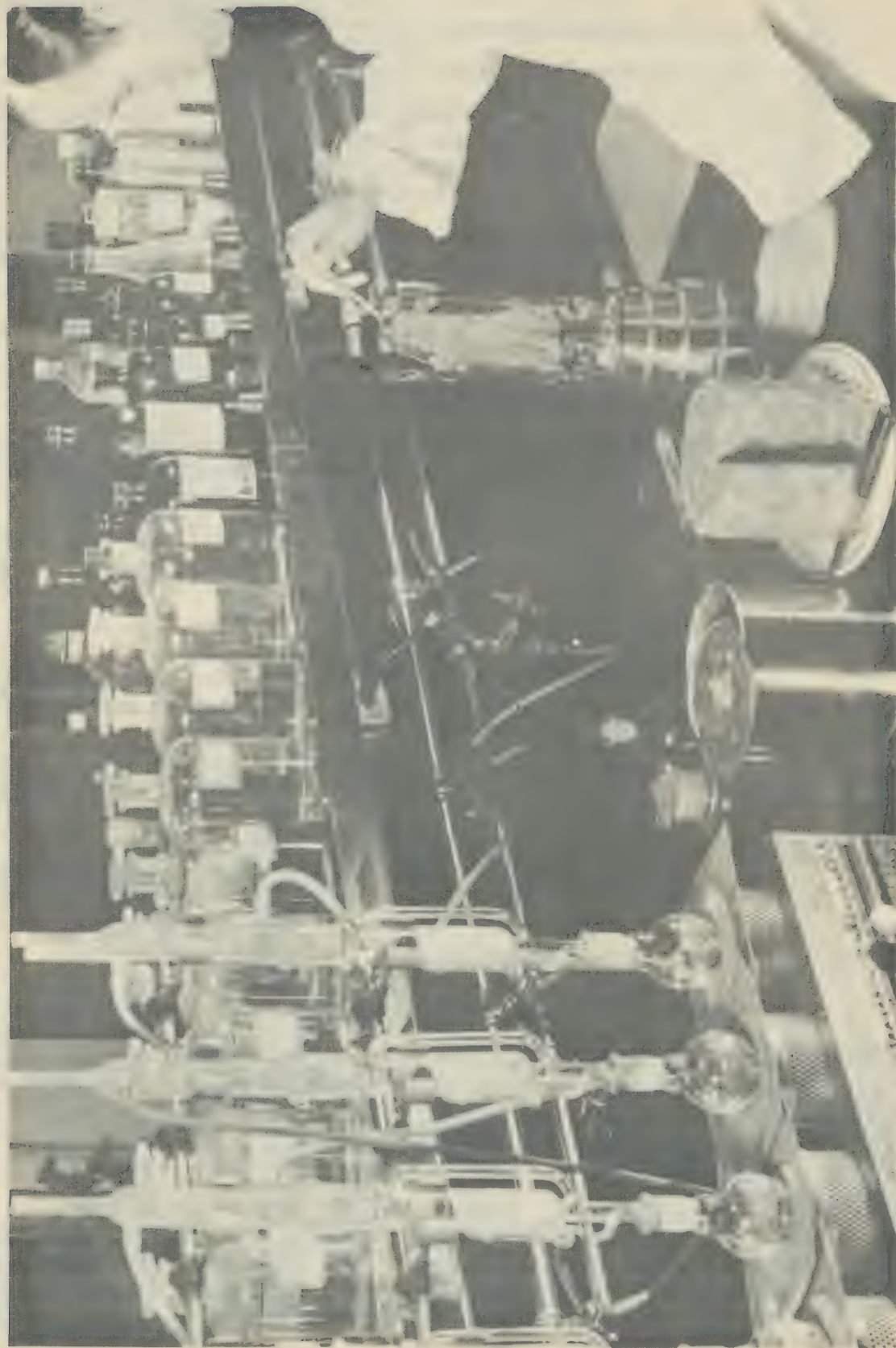
Two of the units used for large scale freeze-drying of biologicals.

- d. Clinical studies on use of aureomycin in treatment of patients with scrub typhus
- 3. Japanese Encephalitis Vaccine (6-61-09-02).
 - a. Fundamental studies on the physical nature of Japanese encephalitis virus with applications of the information gained to the development of a vaccine of increased purity, stability and potency
 - b. The physics of lyophilization using the electron microscope with a view to improving methods of drying antigens and vaccines from the frozen state
 - c. The use of adjuvants to improve the immunogenic activity of highly purified vaccines
- 4. Scrub Typhus Vaccine (6-61-09-09).
 - a. Studies on methods for active immunization against scrub typhus using polyvalent inactive vaccines and attenuated active Rickettsia tsutsugamuchi
 - b. Evaluation and development of tests for the early diagnosis and for the specific diagnosis of scrub typhus
- 5. Virus and Rickettsial Diseases (6-61-03-23).
 - a. The development of a stable vaccine against smallpox which will retain its potency when subjected to tropical conditions
 - b. Studies on the animal reservoir of the virus of encephalomyocarditis and the method by which this agent is transmitted to man
 - c. The development of a specific test by which the virus agents belonging to the lymphogranuloma venereum group may be readily differentiated
- 6. Infectious Hepatitis (165-1).
 - a. The search for a lower animal host for the viruses of infectious hepatitis and homologous serum jaundice among North American wild life and the development of specific laboratory tests for these diseases

c. Veterinary Division:

(1) Historical

Major (later Brigadier General) Raymond A. Kelser, working in the Veterinary Division (1928) introduced a chloroform treated rabies vaccine used in the single injection method for immunization of dogs. Later (1932-33) he demonstrated that Eastern encephalomyelitis virus was transmitted by mosquitoes.



Preparing a sample of food for chemical analysis in the Food Chemistry Section, Veterinary Division.

Colonel Raymond Randall developed the mass production technique as applied to neurotropic chick embryo virus vaccines, and introduced a technique based on pH combined with high speed centrifugation for purification of Eastern, Western and Venezuelan encephalomyelitis virus vaccines for human use. In collaboration with Babcock and Windham he found that using very low storage temperatures and avoiding fluctuation of this temperature made shipment of frozen homogenized milk possible anywhere without precipitation of the proteins or development of off flavors.

In 1944 Colonel Randall reported the first case of fatal Venezuelan encephalomyelitis occurring naturally in man.

(2) Research projects

(a) Allergenic Manifestations Following Use of Vaccines Prepared from Embryonated Eggs (6-61-09-08).

The problem of allergenic sensitization following the use of chick-cultivated virus vaccines appears to have resolved itself into a problem of vaccine or virus purification in an attempt to remove as much inert and potentially sensitizing egg and chick tissue material as possible. In two experiments with crude Eastern equine encephalomyelitis vaccine and Japanese encephalitis vaccine treatment with ion exchange resins reduced the sensitizing capacity of the vaccines. Japanese encephalitis virus suspensions have now been purified somewhat better than five-fold with little or no reduction in virus potency as tested in mice.

In the production of Japanese encephalitis virus in eggs for vaccine the optimum dose of seed virus is the smallest amount which yields the highest titer of virus. The present use of a 10 per cent embryo suspension for seed is costly and may not give the maximum yield. For this reason experiments are being conducted to determine the optimum dose of seed virus by using different amounts and measuring the virus yield by titration in mice.

(b) Analysis, Laboratory Inspection and Storage of Dairy and Meat Products (6-62-02-01).

1. Frozen Milk. A study is being made of how milk freezes. Both homogenized and plain whole milk are placed in the freezer and samples removed hourly after freezing begins. Analysis is made for total solids, fat, protein and ash. The first portion to freeze in homogenized milk is mainly water, with all milk constituents increasing in the frozen portion as freezing progresses. The milk solid content of the unfrozen portion increases greatly as the volume of unfrozen liquid decreases. Plain whole milk is comparable except that most of the fat is found in the top section.



Bacteriological examination of dairy products Veterinary Division.

2. The Effect of Added Cane Sugar on the Keeping Quality of Frozen Homogenized Milk. It has been noted that sweetened condensed milk and similar products are not subject to the deleterious changes common to homogenized whole milk in frozen storage. Cane sugar added to homogenized milk, in too small amounts to affect flavor, may prevent the usual sediment formation or lengthen the storage life of the milk.
3. Determination of the Frozen Storage Potential of Stabilized Chocolate Milk. This product contains a stabilizer to prevent settling of the chocolate. A frozen pint sample was divided into top and bottom sections and analyzed. The analysis figures were the same for the two sections. Samples are now in frozen storage and will be removed and examined at intervals to note any defects.
4. Substitution of Benzin for Anhydrous Ether for Fat Extractions by the Soxhlet Method. Benzin (petroleum ether), boiling range 30-60° C, has important advantages over anhydrous ether for fat extractions. The principal ones are: It remains anhydrous and need not be dehydrated between uses by a potentially dangerous process as must ether. Ether can pick up enough moisture to be unusable by exposure to moist air. It is slightly less volatile, so less is lost in the extraction process by evaporation and therefore less is required. The initial cost is considerably less than for anhydrous ether. The Army routinely uses benzin instead of ether for fat extractions in meat. Experience shows it to be equivalent. However, since no actual figures have been published on the comparison of the two, this laboratory is conducting such comparison to substantiate the accuracy of the fat test using benzin.
5. Simplification of the Method for Salt Determinations in Meats and Similar Products. A greatly simplified salt determination method has been used here for several years. It is accurate, but no published data prove this. Trials have been conducted using two official methods as controls. Our method requires less time, is less expensive to run, and duplicate samples check well with each other and with controls.

(c) Equine Encephalomyelitis (6-62-05-01).

In addition to the development of a highly potent equine encephalomyelitis vaccine of chick embryo origin for horses, a purified vaccine has been perfected for human use. The purified vaccine contains one-tenth of the amount of inert chick tissue present in the horse type vaccine. Eastern, Western and Venezuelan strains of the purified vaccine are being produced for human use.

Data have been completed relative to the first known vaccination of humans with the Venezuelan equine encephalomyelitis vaccine. It was found that it required three doses of 1 cc each of vaccine to produce appreciable amounts of neutralizing antibodies. Complement-fixing antibodies have in general conformed with the neutralizing antibodies.

Studies on the keeping quality of purified lyophilized equine encephalomyelitis vaccines suitable for human use are continuing. There was no evidence of loss of immunogenic properties over a period of 22 months subsequent to lyophilization of Western type vaccine.

(d) Equine Infectious Anemia (6-62-05-04).

The study of equine infectious anemia has been seriously handicapped by the lack of either a susceptible laboratory animal or means of cultivating the virus. Attempts are being made to establish the virus in chick embryos, birds and wild animals.

(e) Leptospirosis in Animals (6-62-05-05).

Agglutination-lysis tests which are currently used for diagnosis of leptospirosis can be done only in a few laboratories where there are properly trained personnel and stock cultures of the organism. A suitable complement-fixation test would greatly simplify the diagnosis. An antigen prepared from leptospira, disintegrated by sonic vibration, has proven very successful. Work is being continued on a precipitin test for leptospira which has worked well with positive rabbit sera but so far has failed to give good positive results with human or canine sera.

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